D100 SERIES

DIGITAL READOUTS

Operation Manual

(Version 2.0)

Dear consumer:

Thank you for buying the 2V/3V multifunctional Digital Readout (DRO) products manufactured by our company. This kind of DRO is widely used on the machine tools such as milling machines, lathes, electric discharge machines, grinding machines, etc. and detecting equipments, as well as in the positional and auxiliary processing of manual operation.

Operation Manual:

This manual is the instruction for operation and use of 2V and 3V multifunctional DROs.

Mode D100-2V: 2 axis DRO, applicable to the 2 axis milling machines, grinding machines, lathes and the machines require 2 axes display.

Mode D100-3V: 3 axis DRO, applicable to the machines require 3 axis display, such as milling machines, lathes, Electrical Discharge Machines etc.

Safety Precautions:

In order to prevent electric shock or fire disasters, the DRO must be kept dry or not be splashed directly by the cooling liquid.In the case that the DRO emits smoke or peculiar smell, pull out the power plugs immediately to prevent fire disasters and electric shock. Then contact our company or the dealers, do not try to repair it by yourself.

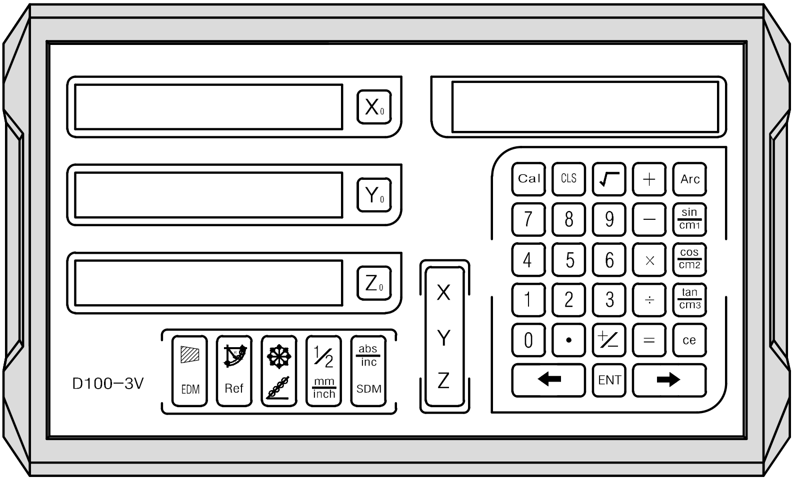
The DRO is connected with the grating ruler or other displacement sensors to form the precise measuring system. Special attention should be paid when using the measuring system, and do protect the connection between the grating ruler and DRO from damage to avoid measuring errors.

Do not repair and modify the measuring devices of DRO by yourself, otherwise the failure, fault or damage will be caused. If any abnormality occurs, please contact our company or the dealers.

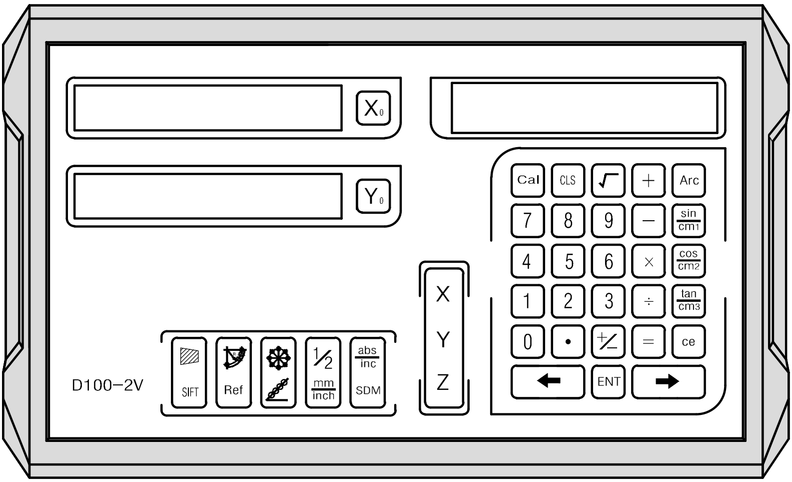
When the sensors (such as grating rulers, magnetic grating rulers, rotary encoders) used with the DRO device are damaged, do not use other brand products to replace the damaged ones, for the products of each company have different features, index, interface and modes. Please replace the damaged sensors under the professional's guidance; otherwise it is liable to cause damage to the DRO device.

ISO9001

D100-3V Panel of the DRO



D100-2V Panel of the DRO



Instruction of the keypad of the DRO

X Y Z U	Axis selection key
0 1 2 3 4 5 6 7 8 9	Numeric key
+ − × ÷ =	Calculation key (calculator function)
Cal	Caculation key (calculator function)
Ce	Zeroing key (calculator function)
Arc	Restore the trigonometric function (calculator function)
√	Square root calculation key (calculator function)
•	Decimal point input key
+/−	Minus input key
ENT	Confirm key

Instruction of Panel and keypad

CLS	Delete the input value (calculator function)
1/2	1/2 value calculation function key
mm/inch	The Metric/British units Switching key
Ref	Scale key / Sleeping function key
SDM	200 Points Auxiliary Zero Position Function key
	Arc machining function (PRD) key
	Divide holes on Circumference (PCD) function key Y+Z enabling key (L series DROs)
	Divide holes on an oblique line (PLD) function key
sin/cm1	This key is the sine function key in the calculation function;
cos/cm2	This key is the cosine function key in the calculation function;

Key	Function
tan / cm3	Tangent function key of calculation function
abs / inc	Absolute / relative coordinates transformation key
← →	Selection key
	Taper checking function key
EDM	Congruous Output Function in EDM (3V DROs)
X_0 Y_0 Z_0	Zeroing, reseting
SIFT	Digital filtering function key (2V DROs)

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Content

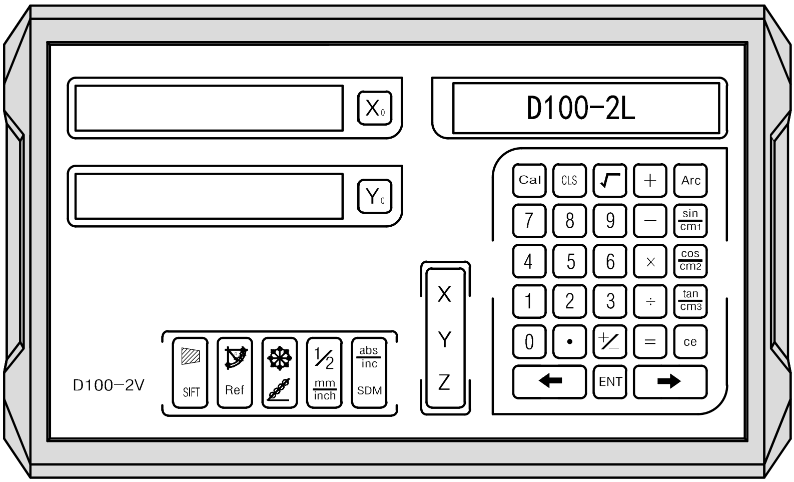
1. Introduction

1. Introduction:

The power switch of the DRO is located on its back. The DRO enters the self-checking state firstly after booting. After the self-checking state is completed, the window at the left side displays the resolution of X, Y and Z respectively, and the window on the right side displays the set machine tool type. D100-2M applies to 2-axis milling machines; D100-3M applies to 3-axis milling machines; D100-2G applies to 2-axis grinding machines; D100-3L applies to 3-axis lathes; D100-2L applies to 2-axis lathes and D100-3E applies to the electric discharge machines.

1.1 2 - axis lathe

D100-V Series



Apply to: 2 - axis lathe

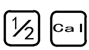
Basic functions:

1) Zeroing; 2) Zeroing reset; 3) Metric/British units switching;
4) Dimension input; 5) ABS/INC coordinates conversion;
6) Power off memory; 7) Full zeroing of 200 sets SDM coordinate origins;
8) Sleeping mode; 9) Ruler storage function; 10) Linear compensation;
11) Non-linear compensation; 12) 200 sets of auxiliary coordinate;
13) Parameters Setting;

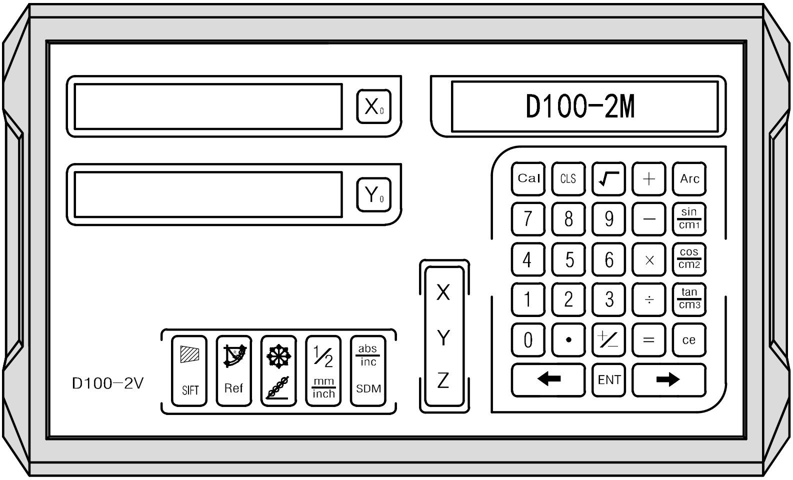
Special functions:

1) Diameter/ radius conversion;
2) Calculator function;

Special keys:



1.2 2 - axis milling machine



Apply to: 2 - axis milling machines, punching machines, etc.

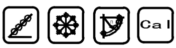
Basic functions:

1) Zeroing; 2) Zeroing reset; 3) Metric/British units switching;
4) 1/2 function; 5) Dimension input; 6) ABS/INC coordinates conversion;
7) Power off memory; 8) Full zeroing of 200 sets SDM coordinate origins;
9) Sleeping mode; 10) Ruler storage function; 11) Linear compensation;
12) Non-linear compensation; 13) 200 sets of auxiliary coordinate;
14) Parameters Setting;

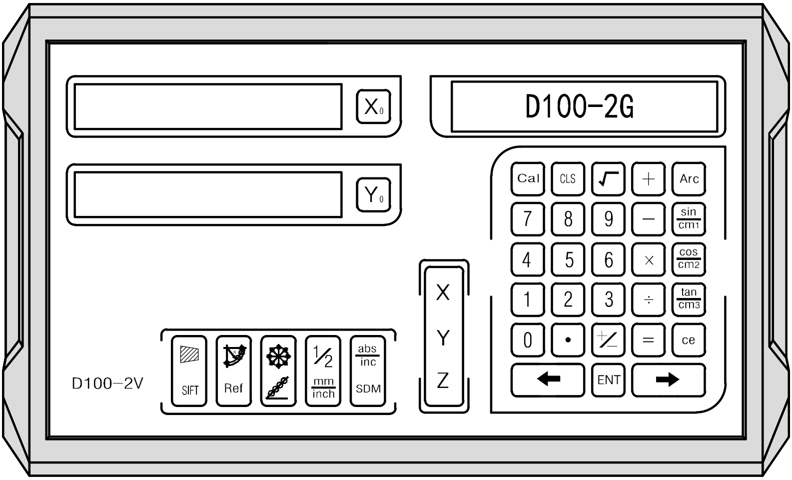
Special functions:

1) Bevel punching function; 2) Divide holes on Circumference (PCD) function;
3) Arc machining function; 4) Calculator function;

Special keys:



1.3 2-axis grinding machine



Apply to: 2-axis grinding machine

Basic functions:

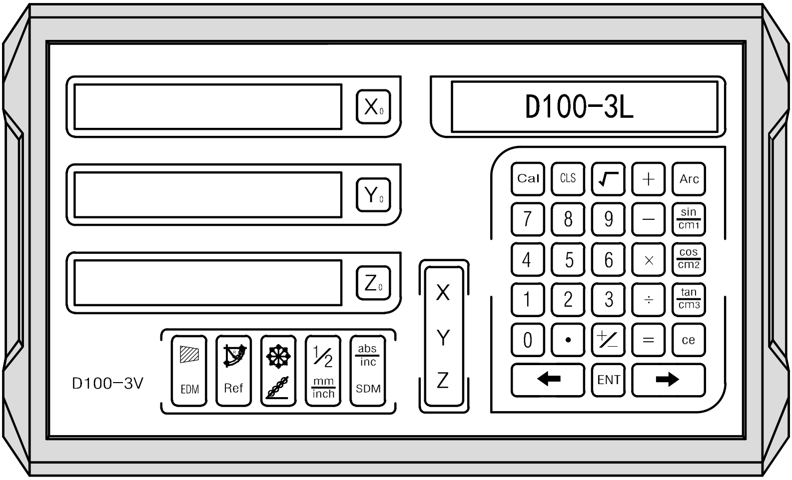
1) Zeroing; 2) Zeroing reset; 3) Metric/British units switching;
4) 1/2 function; 5) Dimension input; 6) ABS/INC coordinates conversion;
7) Power off memory; 8) Full zeroing of 200 sets SDM coordinate origins;
9) Sleeping mode; 10) Ruler storage function; 11) Linear compensation;
12) Non-linear compensation; 13) 200 sets of auxiliary coordinate;
14) Parameters Setting;

Special functions:

1) Digital filtering; (eliminating the display maladjustment caused by the shake of the grinding machine); 2) Calculator function;

Special keys:

1.4 3-axis lathe



Apply to: 3-axis lathe

Basic functions:

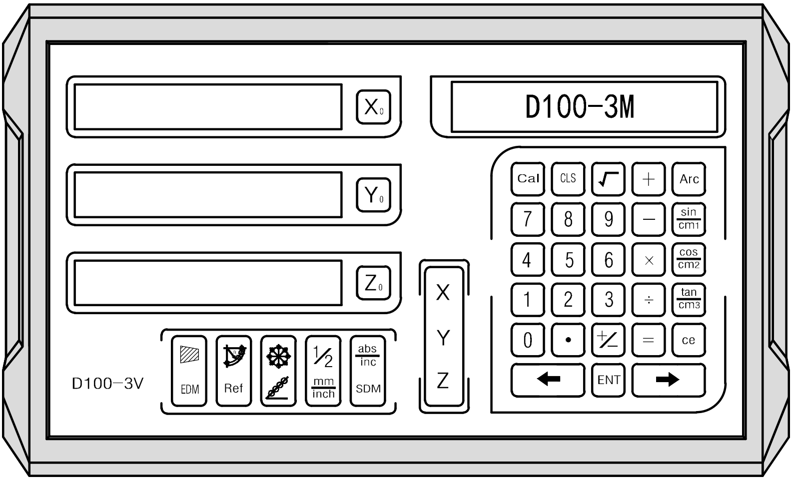
1) Zeroing;
2) Zeroing reset;
3) Metric/British units switching;
4) Dimension input;
5) ABS/INC coordinates conversion;
6) Power off memory;
7) Full zeroing of 200 sets SDM coordinate origins;
8) Sleeping mode;
9) Ruler storage function;
10) Linear compensation;
11) Non-linear compensation;
12) 200 sets of auxiliary coordinate;
13) Parameters Setting;

Special functions:

1) Diameter/ radius conversion;
2) Calculator function;
3) Y+Z function;

Special keys:

1.5 3 - axis milling machine



Apply to: 3 - axis milling machines, punching machines, etc.

Basic functions:

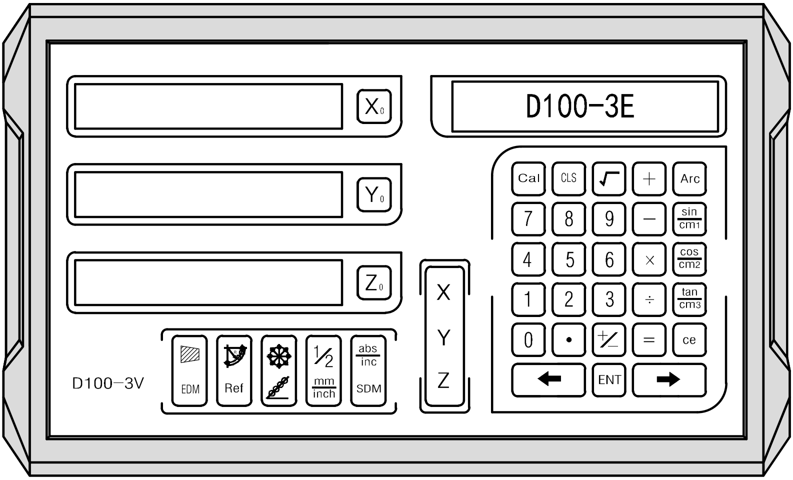
1) Zeroing; 2) Zeroing reset; 3) Metric/British units switching;
4) 1/2 function; 5) Dimension input; 6) ABS/INC coordinates conversion;
7) Power off memory; 8) Full zeroing of 200 sets SDM coordinate origins;
9) Sleeping mode; 10) Ruler storage function; 11) Linear compensation;
12) Non-linear compensation; 13) 200 sets of auxiliary coordinate;
14) Parameters Setting;

Special functions:

1) Bevel punching function; 2) Divide holes on Circumference (PCD) function;
3) Arc machining function; 4) Calculator function;

Special keys:

1.6 EDM DRO



Apply to: EDM

Basic functions:

1) Zeroing; 2) Zeroing reset; 3) Metric/British units switching;
4) 1/2 function; 5) Dimension input; 6) ABS/INC coordinates conversion;
7) Power off memory; 8) Full zeroing of 200 sets SDM coordinate origins;
9) Sleeping mode; 10) Ruler storage function; 11) Linear compensation;
12) Non-linear compensation; 13) 200 sets of auxiliary coordinate;
14) Parameters Setting;

Special functions:

1) Bevel punching function; 2) PCD function; 3) Calculator function;
4) Electric discharge machine (EDM) function;

Special keys:

2. System parameter setting

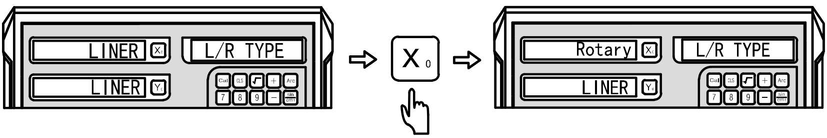
2. System parameter setting

The power switch of the DRO is located on its back. The DRO enters the self-checking state firstly after booting, which includes checking whether the LED display is normal and whether the setting of system resolution and model is appropriate. The self-checking state will sustain until DRO enters normal display state.

Press the [·] key once during the self-checking process, then the DRO will enter system parameter setting state. (Note that pressing just once is OK. If pressing twice, the system will skip the self-checking process and enter normal display state.

In the system parameter setting, we can set parameters as follows: 1) encoder type selection (linear encoder or rotary encoder); 2) resolution setting (Fixed resolution: 0.1um, 0.2um, 0.5um, 1um, 2um, 2.5um, 5um and10um.); 3) Counting direction setting (0 indicates positive direction, 1 indicates negative direction); 4) compensation type setting (linear or nonlinear compensation); 5) parameter setting of rotary encoder; 6) DRO type selection;

2.1: Encoder type selection (LINER stands for a linear displacement transducer matching the axis. Rotary stands for a rotary encoder matching the axis);



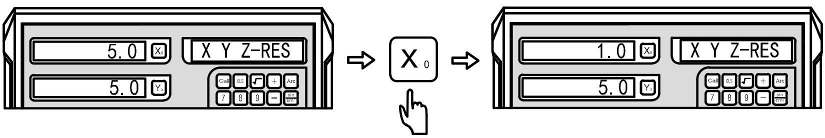
Press [X0] key to alter the encoder type of X axis;
Press [Y0] key to alter the encoder type of Y axis;
Press [Z0] key to alter the encoder type of Z axis;
Press [➡] key to enter step 2 and press [·] key to save and exit parameter setting.

2.2: Resolution setting（Set resolution for the corresponding encoder）

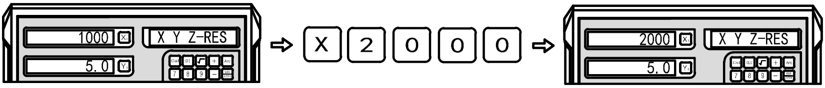
For linear encoder, set the resolution as follows:

Fixed resolution selection: 0.1um, 0.2um, 0.5um, 1um, 2um, 2.5um, 5um and 10um.

Press [X0] key to alter the resolution of X axis. Press [Y0] key to alter the resolution of Y axis. Press [Z0] key to alter the resolution of Z axis.



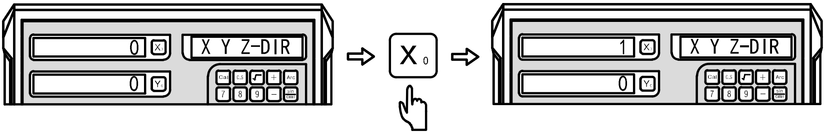
For rotary encoder, set the resolution as follows: (set the resolution of the rotary encoder in the following way). The rotary encoder can display in two ways. When entering the resolution in the way of positive number, the rotary encoder displays in degree (D). When entering the resolution in the way of negative number, the rotary encoder displays in degrees/minutes/seconds (DMS).



Press [→] key to enter step 3 and [·] key to save and exit parameter setting.

2.3: Counting direction selection

When selecting counting direction, it is divided into positive and negative direction (0 on the left window indicates positive counting direction of the window. 1 on the left window indicates negative counting direction of the window.) The operations are shown in the chart below.

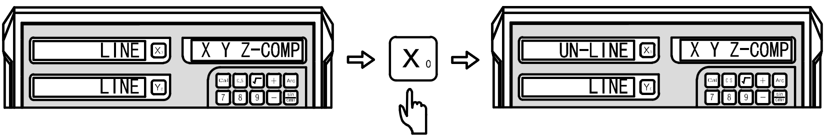


Press [X0] key to alter the counting direction of X axis.
Press [Y0] key to alter the counting direction of Y axis
Press [Z0] key to alter the counting direction of Z axis.

Press [→] key to enter step 4 and press [·] key to save and exit parameter setting.

2.4: Compensation type setting: (Select linear or nonlinear compensation)

When entering the compensation type setting, LINE on the left window indicates linear compensation for the window. UN-LINE on the left window indicates nonlinear compensation for the window. The operations are shown in the chart below.



LINE: select linear compensation type: (see detailed operation in linear compensation setting section)

UN-LINE: select nonlinear compensation type: (see detailed operation in nonlinear compensation setting section)

Press [X0] key to alter the selection of X axis.
Press [Y0] key to alter the selection of Y axis.
Press [Z0] key to alter the selection of Z axis.

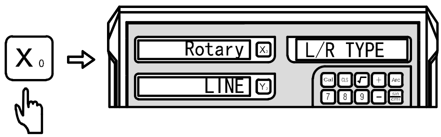
Press [·] key to save and exit parameter setting and back to the user interface.

2.5: Parameter setting of rotary encoder

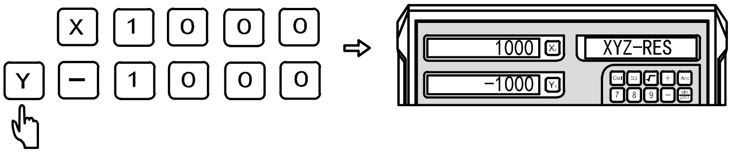
Enter system parameter setting and select rotary encoder. Information screen displays L\R TYPE and X axis displays Rotary, then press key to enter the resolution setting of the rotary encoder when information screen displays XYZ-RES. The resolution varies among different types of encoder, so you have to enter resolution for the corresponding rotary encoder type. When entering resolution, negative value results in degrees/minutes/seconds (DMS) counting mode and positive value results in degree (D) counting mode. This DRO supports a maximum resolution of 99999.

Example: Set the resolution of rotary encoder as 1000P/R

Select rotary encoder

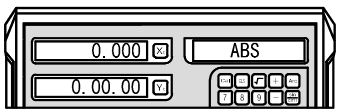


Input the resolution of X axis as +1000 and -1000 to Y axis



After inputting the resolution press key to exit system parameter setting and back to the main menu.

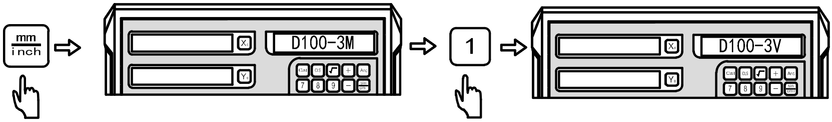
X axis counts in degree (D) mode and Y axis counts in degrees, minutes and seconds (DMS) mode



2.6: DRO type selection

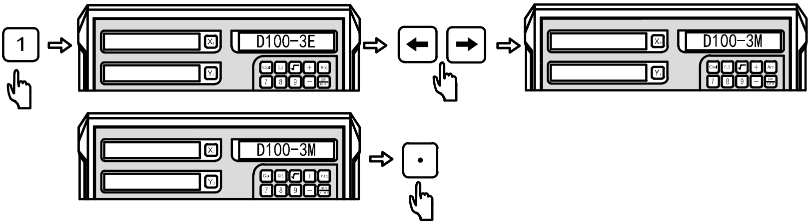
D100-3V multifunction DRO applies to 3-axis milling machines (D100-3M), 3-axis lathes (D100-3L) and EDMs (D100-3E). D100-2V multifunction DRO applies to 2-axis milling machines (D100-2M) and 2-axis lathes (D100-2L) and 2-axis grinding machines (D100-2G).

D100-3V D100-2V and D100-1V Multi-function Digital Readout are easy to set up to use for milling machine,lathe machine,grinding machineand EDM ect.After turning on the DRO,Press Key one time,it will enter digital readout type selection,press 1 key enterDigital Readout selection system,press key choose the axis,D100-1v, one axis,D100-2V two axis D100-3V Three axis.D100-1V include the type:1L,1M,1G. D100-2V include 2L,2M,2G D100-3V include 3L 3M 3E,can be set as users request



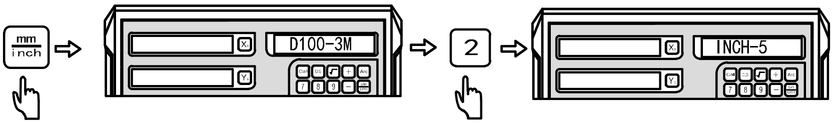
D60-3M Shows the type of digital readout currently

After setting the axis,then press 1 key one time again,then enter digital readout model selection,press ← → choose the neccessary type After it,press · key again to restore the model,then exit the system setting

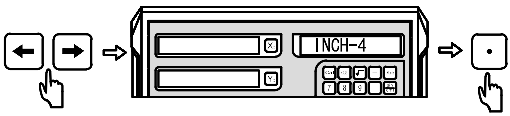


2.6-1 Inch mode decimal point switch function

When the digital readout do self-checking after turning on,press mm/inch key to enter system menu,press 2 one time again enter digital readout Inch mode decimal point switch function Inch mode support four and five decimal points places,Digital Readout defaults to five decimal points.Users can set it accoring to their demands,the setting methods are as follows:



D100-3M Shows the type of digital readout currently

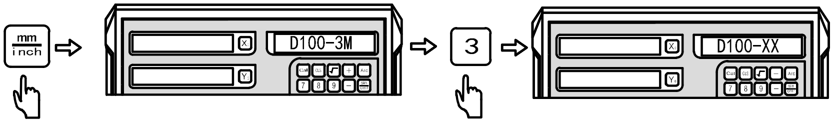


After setting,press · key to restore,then exit Inch mode decimal point switch function.

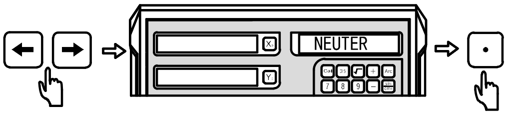
2.6-2 Digital Readout Power On Display settings:

When the digital readout do self-checking after turning on,press mm/inch key one time to enter system menu,press 3 key again to enter digital readout power on display setting.Press ← → Key to switch, D100-XX display shows it is in accordance with the current type of digital readout .

2. System parameter setting



D100-3M Shows the type of digital readout currently



After setting press [·] key to restore then exit Power On Display settings.

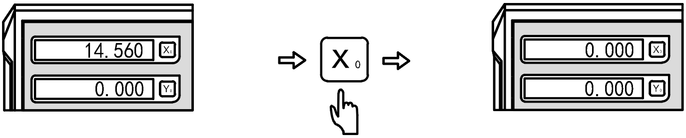
3. Basic functions

3. Basic functions

3.1 Zeroing, data recovery

Function: Operator could zero the displayed coordinate at any position.

Example 1: Zero the displayed value of X axis at the current position.



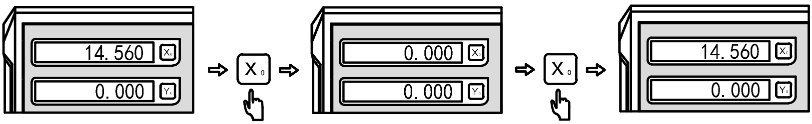
Press [Y0] key to zero the displayed data of Y axis;

Press [Z0] key to zero the displayed data of Z axis;

Data recovery

Function: Recover the data which has been zeroed by mistake at any position.

Example 2: Realize the data recovery of X axis.



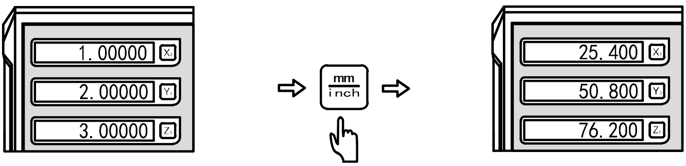
Press [Y0] key to recover the displayed data of Y axis;

Press [Z0] key to recover the displayed data of Z axis;

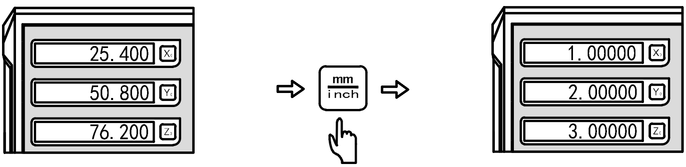
3.2 Display in Metric/British units

Function: Display the location size in Metric (mm) or British (inch) units.

Example 1: Switch the British (inch) units currently displayed to the Metric (mm) units.



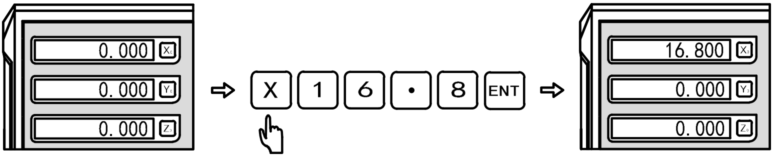
Example 2: Switch the Metric (mm) units currently displayed to the British (inch) units.



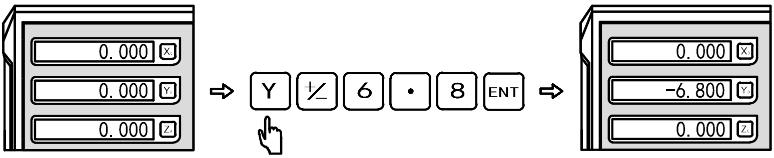
3.3 Input coordinates

Function: Enable the operator to set the current position at any value.

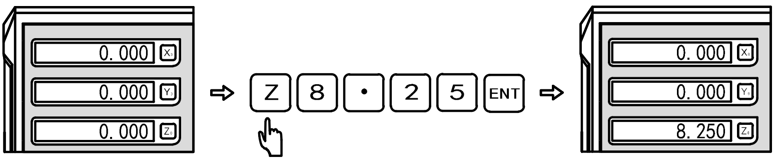
Example 1: Set the position of the current X axis as 16.800 .



Example 2: Set the position of the current Y axis as -6.800 .



Example 3: Set the position of the current Z axis as 8.250 .

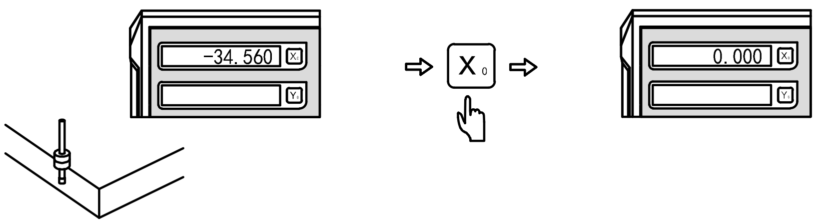


3.4 1/2 function

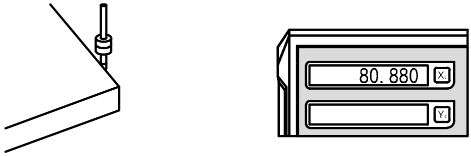
Function: DRO provides automatic centre find function which divides the current displayed position by 2 and sets the zero point at the centre of work piece.

Example 1: Set the zero point of X axis at the centre of work piece

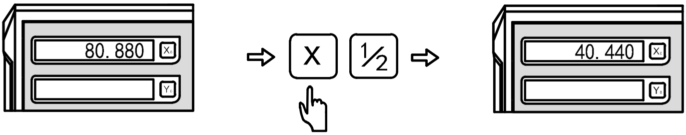
Step 1: Align the optical edge finder on one side of X axis of work piece then clear to zero.



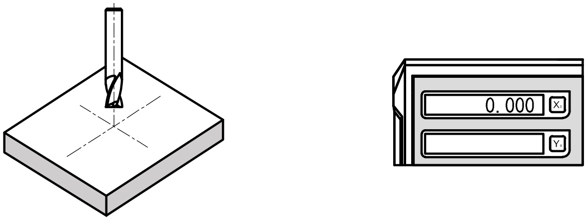
Step 2: Align the optical edge finder on the other side of X axis of work piece.



Step 3: Divide the current display of X axis by 2 according to centre find function.



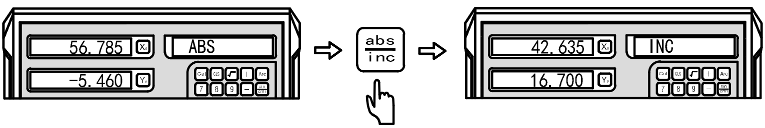
The X-axis centre of the work piece is 0.000. Move the grating ruler to 0.000, which is the centre of the work piece.



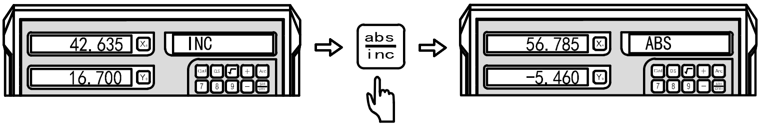
3.5 ABS/INC Coordinates

Function: DRO provides two sets of standard coordinate display value, namely ABS (absolute) and INC (relative) coordinates. The operator could store the reference zero point of work piece at ABS coordinate, and convert ABS coordinate to INC coordinate for machining. Zeroing at any position at INC coordinate won't affect the length value relative to the reference zero point of work piece at ABS coordinate, which shall be stored during the whole machining process and could be checked whenever necessary.

Example 1: Press abs/inc key to convert the current ABS coordinate to INC coordinate



Example 2: Press abs/inc key to convert the current INC coordinate to ABS coordinate



3.6 Full zeroing of 200 sets of auxiliary zero points of SDM

Under ABS state press [•] for 10 times. When information screen displays CLR SDM, it testifies that 200 sets of auxiliary zero locations has all been cleared.

3.7 Power Off Memory Function

In case of sudden powering off during machining process, DRO provides data storage module which could store the coordinate and data before powering off. When DRO is powered on again, all the data before powering off will recover automatically.

3.8 Sleeping function

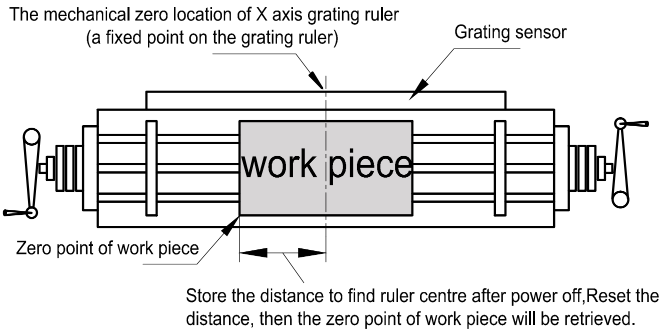
Function: The operator could switch off DRO temporarily during the period when he leaves the machine. (Under non-ABS mode)

Example: Press [Ref] key to pause DRO under non-ABS state. Press [Ref] key again to return to machining state. When DRO returns to machining interface, machining continues.

3.9 Ruler storage function:

Function: In daily machining process, we often encounter such situations as power failure or machining couldn't be finished in one day. If losing the machining zero point, we have to retrieve the zero point of work piece which is troublesome. What's more serious is that there's always errors in retrieving the zero point of work piece by touching, which may cause errors to the parts machined afterwards. DRO provides ruler storage function. It stores the zero point of work piece by using the zero location of grating ruler, which enables the operator to find the zero point easily after power off without retrieving the zero point by touching.

Example: Take the X axis for example:

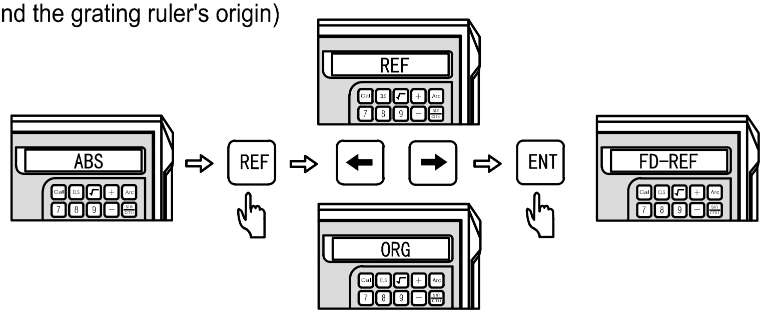


Note: The ruler storage function in our DRO is the most advanced and easiest to use in the DRO market. Each time the operator uses functions which may affect the zero point such as Zeroing, finding centre and inputting coordinate under ABS coordinate, DRO will store the distance between zero point of work piece and ruler centre. So the operator only need operate under the ABS coordinate to set the origin before either switching on the DRO or machining (the work piece hasn't been clamped onto the table). Through which the DRO will record the zero location of the ruler. Then DRO will deal with other storage processes without bothering the operator.

3.9.1 Ruler storage function (set the origin):

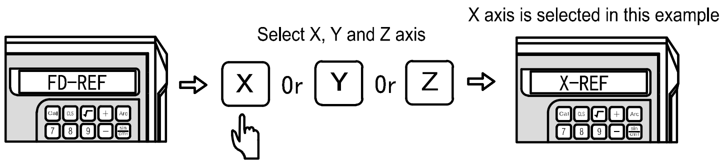
Function: When machining a complex work piece, its zero point couldn't lose under the cases of power off or failing to finish machining in one day. In this case we could set the origin under the ABS coordinate state of DRO to store the origin of the work piece into DRO. DRO will memorize the distance between the zero point of new work piece and ruler centre during all the operations of resetting the work piece's zero point under ABS coordinate such as Zeroing, finding centre and inputting coordinate so as to retrieve the work piece's zero point after power off or closing ruler.

Step 1: Enter REF function and select REF to set the origin.
(Find the grating ruler's origin)

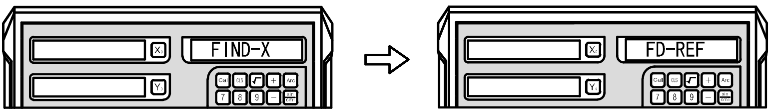


Note: Select REF for ruler storage function (find the grating ruler's zero location) Select OGR for retrieving the work piece's coordinate origin (retrieve the work piece’s coordinate origin)

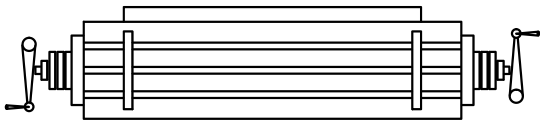
Step 2: Select the axis of the ruler:



Step 3: Turn the hand wheel on X direction of the machine tool and move the table, then DRO will search for the machine zero point of grating ruler on X axis. When the machine zero point is fixed, the buzzer will ring once and the information window will promptly display: Find-X. Repeat step 2 and 3 to complete the ruler storage function of Y and Z axis.



Turn the machine tool to find the grating ruler’s zero location



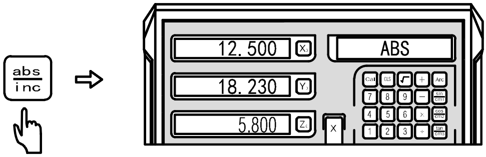
Step 4: Press Ref key to exit ruler search function and back to he machining interface.

3.9.2 Retrieve the work piece’s origin:

Function: When machining a complex work piece, the zero point gets lost because of sudden power off. After the power is connected, we couldn’t keep on machining until we retrieve the work piece’s zero point. Note that we couldn't move the machine by this time. When DRO's self-checking finishes, press abs/inc key back to ABS coordinate (not necessary if DRO is already under ABS coordinate when switched on). By this time we need to record the data of X, Y and Z axis under the current ABS mode. Detailed operating steps are shown below.

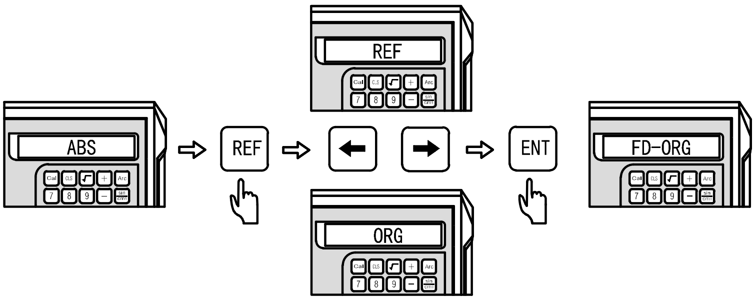
Step 1: Record the data of X, Y and Z axis under ABS mode when DRO completes self-checking:

Example: If DRO completes switch-on self-checking under ABS mode X axis is 12.500   Y axis is 18.230   Z axis is 5.800 .



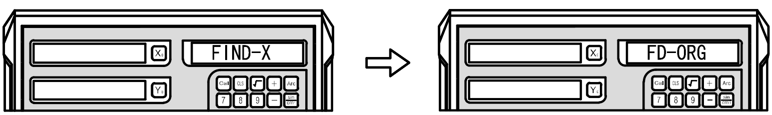
Note: DRO couldn't deal with the data of X, Y and Z axis automatically, so they need to be recorded to find the zero point.

Step 2: Enter REF function and select the function of retrieving the work piece's origin:

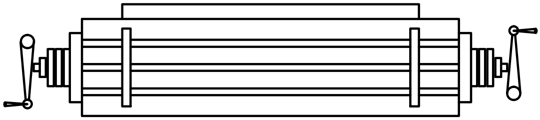


Note: Select REF for ruler storage function (find the grating ruler's zero location) Select OGR for retrieving the work piece's coordinate origin (retrieve the work piece's coordinate origin)

Step 3: Turn the hand wheel on X direction of the machine and move the table, then DRO will find for the machine zero point of grating ruler on X axis. When the zero point is found, the buzzer will ring once and the information window will promptly display: Find-X. Repeat step 2 and 3 to complete retrieving the work piece's origin of Y and Z axis.

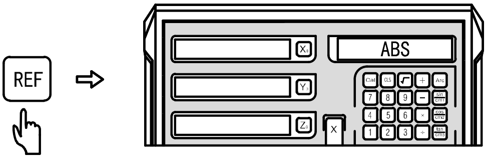


Turn the machine to find the grating ruler's zero location

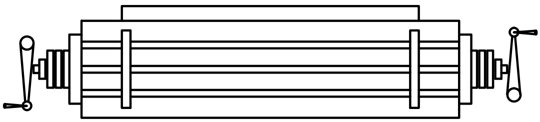


Step 4: After searching the work piece's origins on X, Y and Z axis, turn the machine under ABS coordinate state. When the coordinates of X, Y and Z axis are the ABS coordinates recorded at power-on self-checking, this point is the one when machining stopped at last power off and we could go on machining the unfinished work piece.

Example: Turn the machine to the coordinates recorded manually at power-on self-checking under ABS mode.



Turn the machine to retrieve the working point when machining stopped at last power off.



Press [Ref] key to exit the ruler tracking number function.

Note: Retrieve the work piece's origin. The data couldn't be recovered until the origin is set before machining.

3.10 Linear compensation

Function: Linear error compensation function is used to correct the system errors of the grating ruler measurement system linearly.

Note: the calculation formula of correction coefficient is:

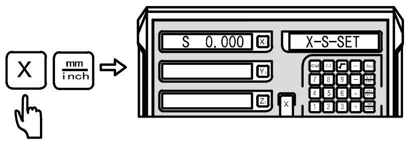
Correction coefficient S = （L - L1）/（L / 1000）mm/m
L: Stands for the actual measured length (mm)
L1: Stands for the displayed value (mm) on the DRO
S: Stands for correction coefficient (mm/m) (+ indicating lengthening and – indicating shortening)
Compensation range: - 1.9 mm/m to + 1.9 mm/m

Example: The actual length of the machine's X axis table is 1000.000mm and the displayed value on the DRO is 999.880mm. The correction coefficient is calculated as follows:

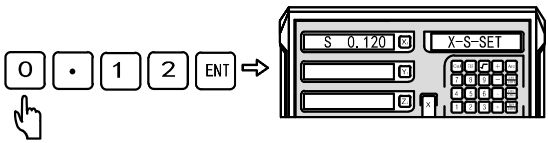
S = （1000.000 - 999.880）/（1000.000 / 1000.000）= 0.120

Set the linear compensation coefficient according to the following operation (Note: Set the compensation method as linear compensation in the system parameter setting section firstly. The detailed operations are described in system parameter setting section.)

Step 1: Press [X] key and then [mm/inch] key and the DRO will enter linear compensation setting.



Step 2: Input the correction coefficient, then press [ENT] key and the linear compensation function will be prompted automatically.



Note: The linear compensation operation of Y axis or Z axis resembles that of X axis.

3.11 Non linear compensation

Function:

Non linear compensation enables the operator to input non linear error compensation value in the DRO by which way the DRO could compensate all kinds of errors of the machine. Non linear compensation function of DRO could improve the accuracy of the machine greatly if only the positions of the machine have a high repeatability. This function is particularly applicable to the machine tools which have a high requirement on accuracy, such as grinding machine, boring machine etc.

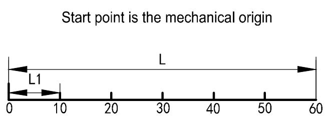
Operating principles:

Non linear compensation adopts a fixed position provided by the REF position in the grating ruler as the absolute zero point of the machine. CPU of the DRO will compensate the readings according to the input error list in the parameter setting section. The software of the DRO could provide non linear error compensation function on X, Y and Z axis. Each axis has a maximum compensation value of 40 points. Note that non linear and linear compensation couldn't be used simultaneously.

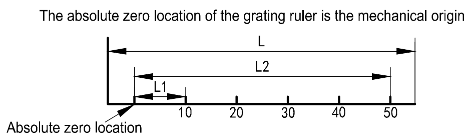
This DRO has two methods for non linear error compensation:

1、Take the start point as the mechanical origin to make error compensation. (Figure 1)

2、Take the first absolute zero point of the grating ruler as the mechanical origin to make error compensation. (Figure 2)



(Figure 1)



(Figure 2)

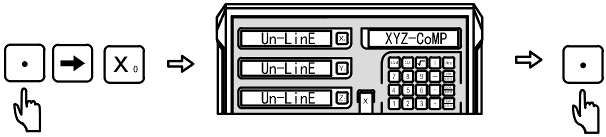
L: Distance of the grating ruler's effective range

L1: Length of the compensation part

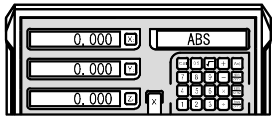
L2: Effective distance of compensation

1、**Parameters are set as follows: (The operation method for X, Y and Z axis is the same).**

Step 1: Set the compensation method as non linear compensation in the system menu after booting. Press [•] key and then [→] key to select XYZ-CoMP. Then press [X0] , [Y0] and [Z0] keys to set X, Y and Z axis as non linear compensation. If X, Y and Z axis display Un-LinE respectively, it indicates that non linear compensation has been set. Press [•] key again to exit system menu setting.



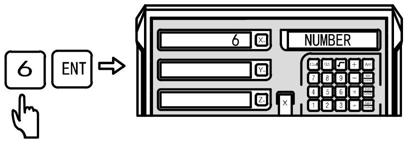
Step 2: Move the grating ruler to the minimum end of coordinate data for Zeroing. DRO enters the ABS absolute coordinate display method.



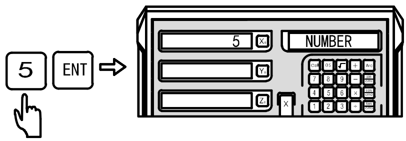
Step 3: Press X key and then mm/inch key to enter the non linear compensation function of X axis and input the relative parameters.

Step 4: Input the compensation part number

Set according to Figure 1:

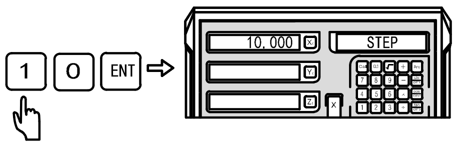


Set according to Figure 2:

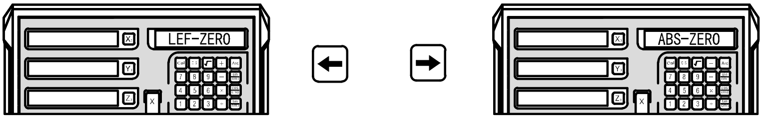


Note: The compensation part number of any axis should be inputted on X axis.

Step 5: Input the length of each compensation part



Step 6: Select the start point (non linear compensation takes the zero location as the start point. There are two kinds of zero location: a. the left zero, b. the mechanical zero location under ABS coordinates. Select by pressing ← and → keys)



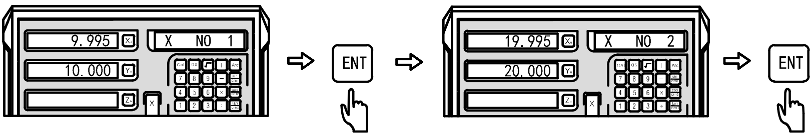
Method A: Zeroing at left

Method B: zero location under ABS coordinates

Method A (zeroing at left), clear the start point at the left and confirm by pressing ENT key.
Method B (ABS zero location), the operation is similar to finding the zero location under REF. It enters the compensation interface automatically after finding the zero location.

Zero location is a counting point and the most important reference point of non linear compensation. After entering the compensation interface, X axis displays the actual data of the grating ruler and Y axis displays the compensation value of the compensation axis.

Step 7: Input the adjusted values segmentally and press ENT key to enter the next point.



X axis displays the actual moving value of the grating ruler and Y axis displays the corrected value. When inputting the corrected value, we should measure from the start point to the displayed corrected value position of Y axis firstly and then move the X axis grating ruler to the measured standard value position.

Press ENT key to set the next point.
Note: In this function the compensation range couldn't exceed 1mm/m, or the compensation is set as 0.

2、**Method of cancelling non linear compensation value:**

Non linear compensation value could only be used to the DRO, grating ruler and machine when they are set together. When a grating ruler or DRO whose compensation value has been set on a certain machine is moved to another machine, this non linear compensation value is incorrect. In this case we should cancel or reset the non linear compensation value.

The method of cancelling is：

According to the non linear compensation set method indicated above, input the compensation part as 0 when prompted to initialize all the compensation parameters. At present all the compensation parameters set before will be invalid and the current compensation value is zero.

3、**Method of retrieving the mechanical origin**

When it was power off during grating ruler movement or grating ruler moved without power on, we have to find the mechanical origin again before booting. Because when the machine is moved under power off, the origin of the machine coordinate couldn't match the value on the DRO. If we don't retrieve the mechanical origin, such dislocation will be brought into the subsequent user coordinate system, as the non linear compensation value is set based on wrong mechanical coordinate when calculating the user coordinate, which brings errors to display coordinate.

Set the mechanical origin as follows:

Enter non linear compensation after booting. When inputting compensation part number and compensation length, make no change and press [ENT] key directly to skip. Then we come to select the compensation start point, select ABS-ZERO（ABS zero location）and press [ENT] key to find the zero location. At this time the information screen displays RESET-X, slide the X axis grating ruler to find the zero location until DRO gives out a sound. System has entered the compensation interface automatically then press [mm/Inch] key to exit non linear compensation.

Note:

The work origin could only be retrieved when the start point of non linear compensation is set at the ABS zero location. If set the leftmost as the ABS zero location, the work origin couldn't be retrieved. At this time we have to reset the non linear compensation. The following method is recommended for setting non linear compensation: set the compensation start point as ABS zero location. The user searches the mechanical origin after each booting to guarantee the consistency of the mechanical origins.

3.12 200 sets of auxiliary zero location:

Function:

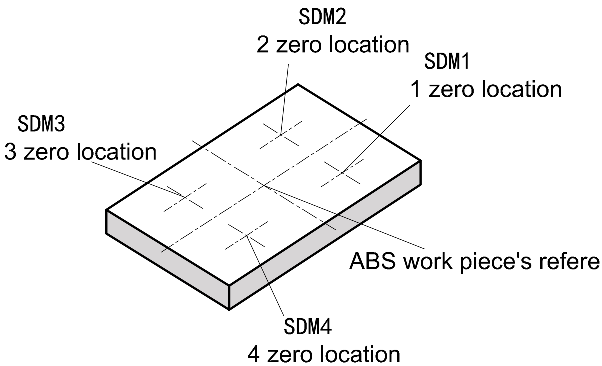
Typical grating DRO only provides two groups of coordinates, namely ABS/INC. But in most of the daily machining occasions, operators always find it not enough, especially in die machining or small batch machining. The DRO provides 200 sets of auxiliary zero location (SDM) function to compensate for the shortage of the ABS/INC function. But SDM is not just a simple additional INC coordinate, it has the following difference compared to ABS/INC.

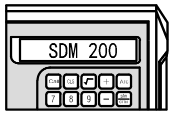
1. INC zero location is completely independent. Regardless of any change in ABS zero location, INC zero location will never change. But the zero location of SDM is relative to ABS, which means when ABS zero location changes, all the SDM zero locations shall change correspondingly.

2. The distance of SDM relative to ABS coordinate could be entered by keys directly, which is both fast and precise.

Applications of SDM in sub zero point:

Operators could set each sub zero location on the work piece in the SDM auxiliary zero location coordinates.

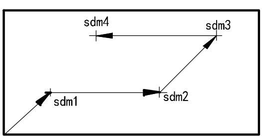


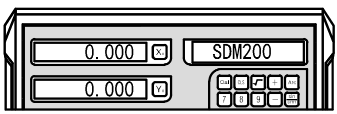


Press ← key or → key to convert to SDM auxiliary zero location directly without returning to ABS coordinate.

Applications of SDM in small batch machining

SDM function could store batch of working point positions in SDM zero location. Operators could enter all the working points to the DRO at once. Alternatively, operators could also input the working points into SDM of DRO when machining the first work piece. Afterwards they only need to adjust the reference zero location of the subsequent work pieces in ABS coordinate. As the SDM zero locations correspond to these of ABS, all the working point shall recur by SDM zero locations.





ABSzero

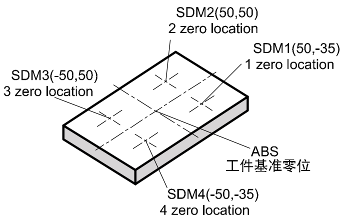
Reference of work piece (0.000)

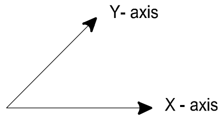
Input the required coordinate value under SDM state according to SDM or press [←] and [→] keys to turn to each SDM auxiliary zero location. Move the machine until each SDM coordinate displays 0, which is the position of each working point.

SDM application examples:

If you need set 4 auxiliary zero locations on the work piece (from SDM1 to SDM4), two methods are available:

1. Zeroing in place.
2. Input each SDM coordinate by pressing keys directly.





Method I: Zeroing in place

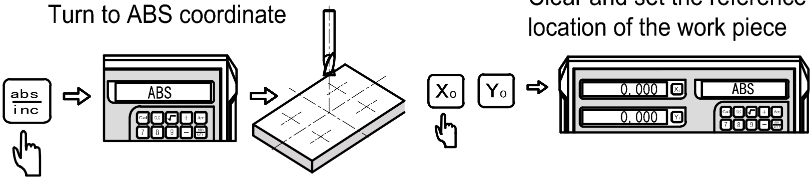
At first set the reference zero location of the work piece in ABS coordinate and move the table to each SDM zero location directly, then turn to SDM Zeroing and memorize the zero location.

Step 1: Set the reference zero location of the work piece in ABS coordinate

Move the table to reference zero location of the work piece

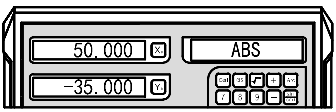
Turn to ABS coordinate

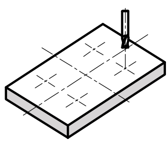
Clear and set the reference zero location of the work piece



Step 2: Set the first zero location

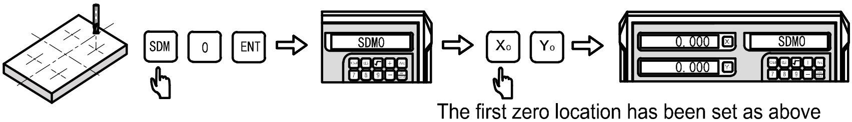
Move the table of the machine to X=50.000，Y=-35.000 under ABS mode.





Enter SMD0 according to the figure below

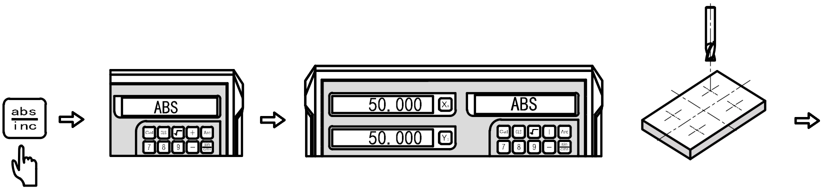
zeroing as following methods



The first zero location has been set as above

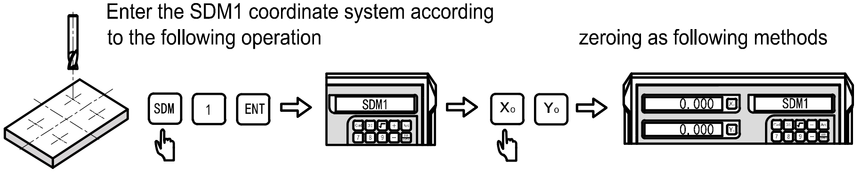
Step 3: Set the second zero location

Enter the ABS coordinate system according to the following operation. Move the table of the machine to fix the tool at the position of X=50.000, Y=50.000.



Enter the SDM1 coordinate system according to the following operation

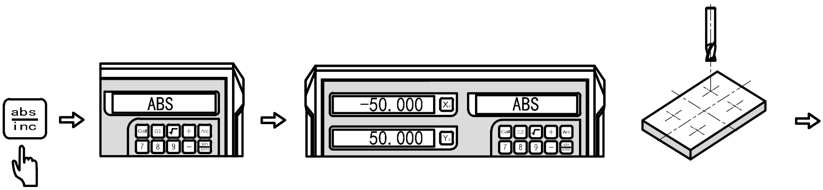
zeroing as following methods



The second zero location has been set as above

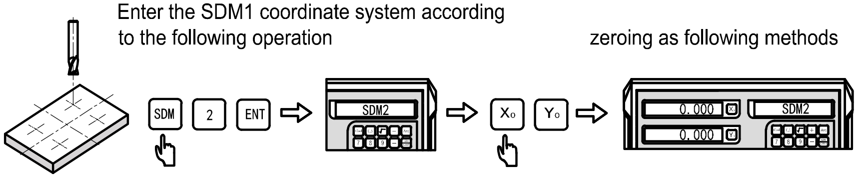
Step 4: Set the third zero location

Enter the ABS coordinate system according to the following operation. Move the table of the machine to fix the tool at the position of X=-50.000, Y=50.000 .



Enter the SDM1 coordinate system according to the following operation

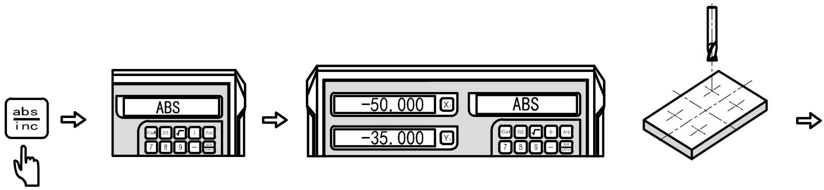
zeroing as following methods



The third zero location has been set as above

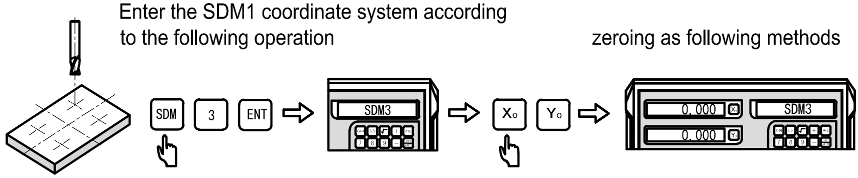
Step 5: Set the forth zero location

Enter the ABS coordinate system according to the following operation. Move the table of the machine to fix the tool at the position of X=-50.000, Y=-35.000 .



Enter the SDM1 coordinate system according to the following operation

zeroing as following methods

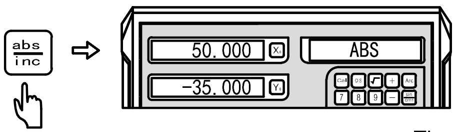


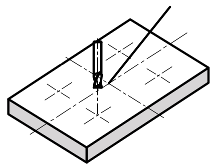
The forth zero location has been set as above

Press [←] and [→] keys to check whether the SDM coordinate inputted is correct. Checking operation as follows (check the coordinate of SDM3 origin under ABS, SDM0, SDM1, SDM2 and SDM3 coordinate systems.)

The present values of SDM3 origin correspond to ABS absolute coordinate system

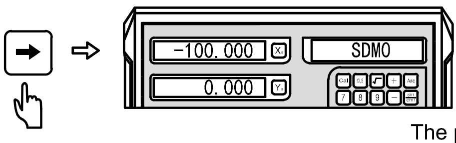
Enter the ABS coordinate system according to the following operation

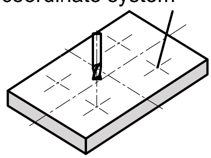




The present values of SDM3 origin correspond to SDM0 coordinate system

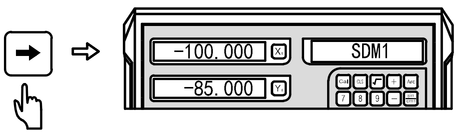
Enter the SDM0 coordinate system according to the following operation

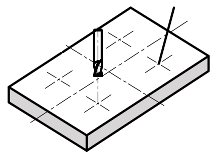


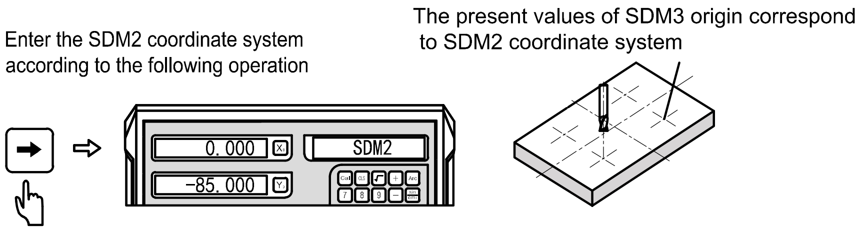


The present values of SDM3 origin correspond to SDM1 coordinate system

Enter the SDM1 coordinate system according to the following operation





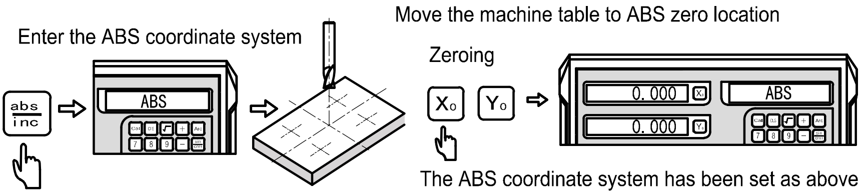


Zeroing in place is simple and clear, but lots of SDM zero locations have to be built up, which is inefficient, so method 2 is recommended.

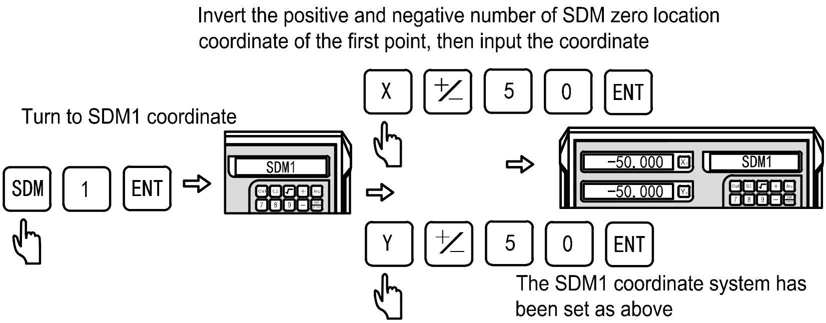
Method 2: Enter SDM coordinate by pressing keys directly

The method of inputting SDM coordinate by pressing keys directly: At first set the reference zero location of the work piece in ABS coordinate and move the machine table to ABS zero point, then input all the SDM zero location coordinates in once at this position.

Step 1: Set the reference zero location of the work piece in ABS coordinate



Step 2: Set the zero location of the first point

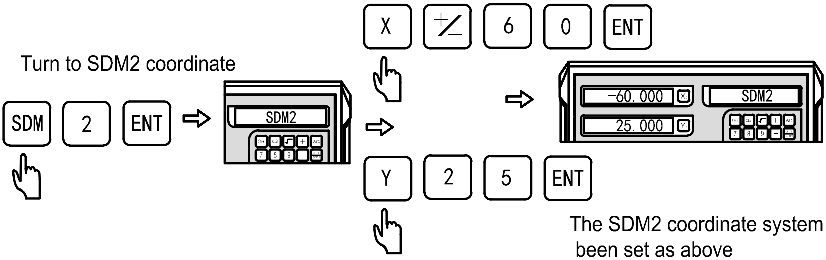


Note: When inputting all the SDM zero locations directly, we have to treat the coordinate values of the SDM zero location on the chart by positive and negative inversion. That's because the SDM zero coordinate on the chart takes ABS zero location as parameter, while in practice it takes SDM zero location as parameter. It is parallel to treat the ABS zero coordinate by different SDM zero locations.

Step 3: Set the zero location of the second point

Invert the positive and negative number of SDM zero location coordinate of the second point, then input the coordinate

Turn to SDM2 coordinate

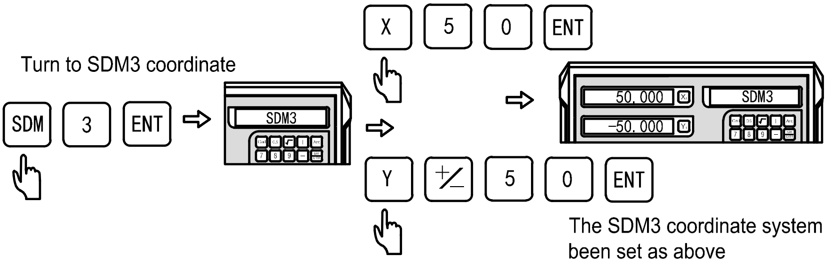


The SDM2 coordinate system has been set as above

Step 4: Set the zero location of the third point

Invert the positive and negative number of SDM zero location coordinate of the third point, then input the coordinate

Turn to SDM3 coordinate

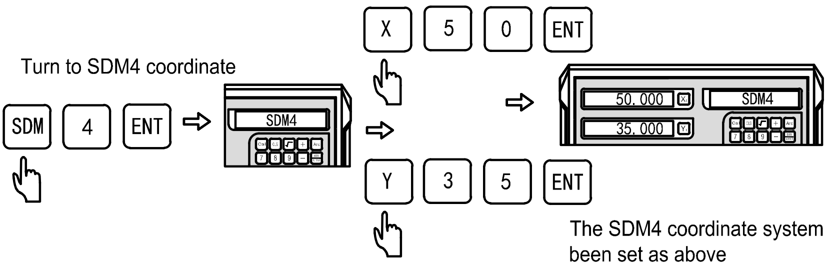


The SDM3 coordinate system has been set as above

Step 5: Set the zero location of the fourth point

Invert the positive and negative number of SDM zero location coordinate of the forth point, then input the coordinate

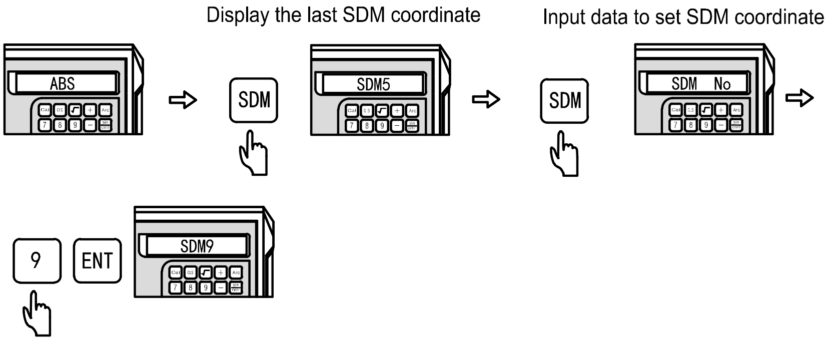
Turn to SDM4 coordinate



The SDM4 coordinate system has been set as above

Note: Quick setup SDM coordinate

DRO provides 200 sets of coordinates from 0 to 199. It is inefficient to set by [←] and [→] keys.Under ABS or INC coordinate we have to press [SDM] key twice to set. But under SDM coordinate we only need to press [SDM] key once to set SDM coordinate, the detailed operation is as follows:



4. Special Function

PLD Function